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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/742,473	12/22/2000	Byung-Soo Ko	3430-0161P	9178

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EXAMINER

NGO, HUYEN LE

ART UNIT PAPER NUMBER

2871

DATE MAILED: 06/04/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/742,473	KO, BYUNG-SOO	
	Examiner	Art Unit	
	Julie-Huyen L. Ngo	2871	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-12 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-12 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). ____. |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) ____. | 6) <input type="checkbox"/> Other: ____. |

DETAILED ACTION

Response to Amendment

Applicant's request for reconsideration of the finality of the rejection of the last Office action is persuasive and, therefore, the finality of that action (paper 7 mailed on 2/13/2003) is withdrawn.

However, the claims 1, 3-7 and 9-12 have been amended in last Amendment (paper 6) received on 11/22/2002. Therefore, a new final action is set forth below.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 3-5 and 9-11 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter, which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

In the light of claims 3-5 and 9-11 and specification, the first metal layer made of aluminum is more etched than the second metal layer made of molybdenum. **This seems to be an error and not enable to perform since the etch rate of aluminum is lower or less than that of molybdenum** as disclosed in following references:

- Kakuda et al. (US5162933A) disclose a molybdenum layer 43 more etched than aluminum layer 45 (reference is provided).

Art Unit: 2871

- Kaneko et al (US6404473B1) disclose (fig. 9A-C) a Cr/Mo layer more etched than aluminum layer (reference is provided).
- Shimamune et al. (US5361153A) disclose (Fig. 1D) a molybdenum layer 103/105 more etched than aluminum layer 104 (reference is provided).
- Tsutsumi et al. (US5183533A) disclose (Fig. 5B) the etching rate to the aluminum film 33, which is a metal film, is higher than the etching rate to the chromium film 32 (reference is provided).
- Jeong et al. (US6486494B2) disclose the molybdenum alloy layer having an etch rate larger than an aluminum layer (reference is provided).

Therefore, material of Cr, Mo, Ta, W or their alloy is not higher corrosive than that of Al as claims 3-5 and 9-11 cited and specification disclosed.

Applicants should resolve this rejection by providing the evidences of “the first metal layer made of aluminum being more etched than the second metal layer made of molybdenum.”

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) and the Intellectual Property and High Technology Technical

Art Unit: 2871

Amendments Act of 2002 do not apply when the reference is a U.S. patent resulting directly or indirectly from an international application filed before November 29, 2000.

Therefore, the prior art date of the reference is determined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

Claims 1, 4, 5, 7, 10 and 11 are rejected under 35 U.S.C. 102(e) as being anticipated by Hong et al. (US6172733B1).

Hong et al. teach (Figs. 5a-5e, col. 6 lines 37-67) a method of manufacturing an array substrate comprising:

- forming an electrode line (gate line 111) has a first (Al) and second (Mo) metal layers of dual layer structured on a substrate using a wet etching technique
 - forming an organic insulating layer (gate insulating layer 117) on an exposed surface of the substrate while covering the electrode line
- wherein the end portion of the electrode line has a taper angle of more than 45° from a top surface of the electrode lines (see Figures 5d and 5e).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

For the first metal layer made of molybdenum layer is more etched than a side of portion of the second metal layer made of aluminum layer.

Claims 1-5 and 7 to 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kakuda et al. (US5162933A) in view of Kim et al. (US6188452B1).

With respect to claims 1, 4, 5, 7, 10 and 11, Kakuda et al. teach (Figs. 8 and 10) a method of manufacturing an array substrate comprising:

- forming an electrode line (gate line 13) has a first and second metal layers of dual layer structured on a substrate using a wet etching technique
- forming an inorganic insulating layer (gate insulating layer 25) on an exposed surface of the substrate while covering the electrode line

wherein the end portion of the electrode line has a taper angle of more than 45° from a top surface of the electrode lines (see Figures 8 and 10).

With respect to claims 3 and 9, Kakuda et al. teach (col. 13 lines 30-37) forming an electrode line having first and second metal layers of a dual-layered structure, and a side portion of the first metal layer 43 made of molybdenum layer is more etched than a side of portion of the second metal layer 45 made of aluminum layer by simultaneously etching two metal layers (one example of the invention in Fig. 10).

However, Kakuda et al. fail to disclose a gate-insulating layer made of organic layer from one of benzocyclobutene, an acrylic-based insulating material or resin.

Kim et al. teach (col. 2 lines 44-67) forming a gate-insulating layer made of an organic layer from benzocyclobutene for providing stable TFT characteristics.

Therefore, it would have been obvious for one of ordinary skill in the art to form the gate-insulating layer as Kakuda et al. disclosed with organic layer made of benzocyclobutene for providing stable TFT characteristics.

Claims 6 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kakuda et al. (US5162933A) in view of Kim et al. (US6188452B1) as applied to claims 1, 7 and 11, and further in view of Kaneko et al (US6404473B1).

Kaneko teach (Figs. 9B-C, col. 9, line 56 - col. 10, line 23) manufacturing an array substrate comprising an electrode line having a three-layered structure by simultaneously etching an upper most metal layer (third metal layer) and lowermost metal layer (first metal layer), which sandwiches a middle conductive layer (second metal layer) and have a low corrosion potential, so that a side portion of the second metal layer protrudes beyond side portions of the first and third metal layers. Doing so would suppress the growth of hillock of the second metal layer from the end portion and reduce the processing step.

Therefore, it would have been obvious for one of ordinary skill in the art to form an electrode line on the substrate of Kakuda and Kim device with a first, second, and third metal layers of three-layered structure having a side portion of the second metal layer protrudes beyond side portions of the first and third metal layers, for the reason set forth above, as taught by Kaneko et al.

For the first metal layer made of aluminum layer is more etched than a side of

portion of the second metal layer made of molybdenum layer.

However, examiner believe that Kim et al. (US6048783A) and Hong et al. (US6172733B1) have one common inventor Hye-Young Kim, therefore, the reference of Kim et al. (US6048783A) may repeat the same error: "the first metal layer made of aluminum is more etched than the second metal layer made of molybdenum", see 112 1st paragraph rejection above.

Claims 1-5 and 7 to 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kim et al. (US6048783A) in view of Kim et al. (US6188452B1).

With respect to claims 1, 4, 5, 7, 10 and 11, Kim et al. (US6048783A) teach (Figs. 2A-C) a method of manufacturing an array substrate comprising the steps of:

- forming an electrode line has a first and second metal layers of dual layer structured on a substrate using a wet etching technique
- forming an insulating layer (gate insulating layer 17) on an exposed surface of the substrate while covering the electrode line

wherein the end portion of the electrode line has a taper angle of more than 45°C from a top surface of the electrode lines (see Figures 8 and 10).

With respect to claims 3 and 9, Kim et al. (US6048783A) teach (col. 2 lines 19-23) the electrode line having first and second metal layers of a dual-layered structure, and a side portion of the first metal layer 15 made of aluminum molybdenum layer is more etched than a side of portion of the second metal layer 14 made of molybdenum layer by simultaneously etching two metal layers.

However, Kim et al. (US6048783A) fail to disclose that the gate-insulating layer made of organic layer from one of benzocyclobutene, an acrylic-based insulating material or resin.

Kim et al. (US6188452B1) teach (col. 2 lines 44-67) forming a gate-insulating layer made of an organic layer from benzocyclobutene for providing stable TFT characteristics.

Therefore, it would have been obvious for one of ordinary skill in the art to form the gate-insulating layer as Kakuda et al. disclosed with organic layer made of benzocyclobutene for providing stable TFT characteristics.

Claims 6 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kim et al. (US6048783A) in view of Kim et al. (US6188452B1) as applied to claims 1, 7 and 11, and further in view of Kaneko et al (US6404473B1).

Kaneko teach (Figs. 9B-C, col. 9, line 56 - col. 10, line 23) manufacturing an array substrate comprising an electrode line having a three-layered structure by simultaneously etching an upper most metal layer (third metal layer) and lowermost metal layer (first metal layer), which sandwiches a middle conductive layer (second metal layer) and have a low corrosion potential, so that a side portion of the second metal layer protrudes beyond side portions of the first and third metal layers. Doing so would suppress the growth of hillock of the second metal layer from the end portion and reduce the processing step.

Therefore, it would have been obvious for one of ordinary skill in the art to form an electrode line on a substrate of Kakuda device with a first, second, and third metal layers of three-layered structure having a side portion of the second metal layer protrudes beyond side portions of the first and third metal layers for the reason set forth above, as taught by Kaneko et al.

Response to Arguments

Applicant's arguments with respect to claims 1-12 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.


Contact Information

Any inquiry concerning this communication or earlier communications from the Examiner should be directed to Julie-Huyen L. Ngo whose telephone number is (703) 305-3508. The Examiner can normally be reached on T-Friday.

If attempts to reach the Examiner by telephone are unsuccessful, the Examiner's Supervisor, Mr. Robert H. Kim can be reached at (703) 305-3492.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

May 27, 2003



Julie-Huyen L. Ngo
Patent Examiner
Art Unit 2871